Fifth Grade

How To Be a Wildland Firefighter

Introduction

Good afternoon everyone! I am _____ ___, and I work for the _____ National Forest. Today I'm going to talk to you about how to be a wildland firefighter.

Lesson

How many of you have ever thought about becoming a firefighter? What kind would you want to be? Well today, I am going to give you a crash course in becoming a wildland firefighter. Those are the firefighters who work to control the wildfires that burn in our forests. Today, I'm going to talk with you about the protective gear a firefighter has to wear, show you the tools a firefighter uses, and teach you the basics that all firefighters need to know before they can fight fire.

This wildland firefighter is helping to ignite a prescribed burn. All wildland firefighters have to wear personal protective equipment such as hardhats and gloves to help prevent injury.

Let's start with the protective gear that all firefighters must wear. First, why do you think firefighters have to wear special clothing? The bottom line is firefighter safety. Our goal is to have no firefighters injured or killed in the line of duty. The protective gear I'm about to show you helps ensure that our firefighters remain safe.

Who's going to help me with this demonstration? (Pick a child to come to the front of the class. As you explain the PPE, have the child put on each piece so at the end he/she

Forest Service Messages

A-1: Fire has a natural role in the ecosystem.
A-3: Leaving nature alone has consequences, risks and trade-offs.
A-5: The study of the science of fire and its behavior is important.
B-1: People need to be careful with fire.
B-4: The complexity of managing our public lands is compounded by the numbers of people living near or within our boundaries and the increasing demands from public land users.
C-1: Prior to European settlement, Southwestern ponderosa pine forests had far fewer trees than today and had frequent, low-intensity surface fires.
C-3: Forest conditions now are not natural or healthy.
C-4: Because of unnaturally dense conditions, our forests are at risk for destructive wildland fires, insect infestations and diseases.
C-9: Prescribed fire is one tool the Forest Service uses to meet ecosystem goals.

Academic Standards

Arizona Standards

SCIENCE

3SC-E1: Recognize how scientific knowledge, thinking processes and skills are used in a great variety of careers
4SC-E7: Explain and model the interaction and interdependence of living and non-living components within ecosystems, including the adaptation of plants and animals to their environment
PO 1: Describe the components of an ecosystem
PO 2: Describe how living and non-living components interact within an ecosystem
PO 3: Describe how living and non-living components are interdependent within an ecosystem
PO 4: Explain how plant species adapt to their environment
6SC-E4: Provide evidence of how life and environmental conditions have changed
PO 2: Describe how environmental conditions have changed over time (geologic and recent)
1SC-E6: Analyze scientific reports from magazines, television or other media
PO 1: Analyze the reliability of scientific information from a variety of sources
PO 2: Use evidence to support or refute a conclusion drawn

will look like a wildland firefighter.) Every firefighter must have Nomex pants and shirts. You've seen these yellow shirts before, right? The shirts and pants are made out of a special, fire-resistant material. While the material is fire-resistant, it is not fire-proof. If you threw this into a campfire, it would burn just like your clothes would. The difference is that if we pulled this Nomex shirt out of the fire, it would stop burning, whereas your clothes would continue to burn. Every firefighter must also have high-topped, laced, leather boots; a hardhat; goggles; ear plugs; and leather gloves.

Now with all that gear, doesn't he/she look ready to go fight a fire? But, he/she isn't ready yet. He/she is missing probably the most important piece of firefighting gear. I'm talking about the fire shelter. Fire shelters have saved many firefighters' lives. The fire shelter is used as a last resort in firefighting. If you are being surrounded by fire and there are no escape routes, you would use your fire shelter. The fire shelter protects primarily by reflecting radiant heat and by trapping breathable air. It is made of aluminum foil bonded to fiberglass cloth. Once you are inside the fire shelter, it is basically like a pup tent that helps protect you from the fire's heat. Who wants to help me demonstrate how to use a fire shelter? (Have a student come forward. Show the class how to open a fire shelter. Have the student get in. Then, shake the tent to show what it would be like if a fire were burning nearby.)

So, how does a firefighter carry all this equipment? Most is carried in or attached to what we call an initial attack pack. Firefighters must have their initial attack pack ready to go at all times. Besides the things we've already talked about, firefighters also carry other items they might need including a first-aid kit, head lamp, and MRE (meal ready to eat). Firefighters often carry about 45 pounds worth of gear with them when they go to a fire. Who wants to see what 45 pounds feels like? (Have a student come forward and try on a 45-pound vest. Have them walk around a little and tell the other students what it feels like.)

These wildland firefighters are part of a helitack crew. Part of their job is to rappel into fires that are in rugged terrain. They also have to wear special equipment to help prevent injury.

from a scientific report

5SC-E3: Show that energy exists in many forms and can be transferred in many ways

PO 1: Identify various types of energy sources

PO 2: Describe how energy is transferred

5SC-E4: Identify and predict what will change and what will remain unchanged when matter experiences an external force or energy change (e.g., boiling a liquid; comparing the force, distance and work involved in simple machines)

PO 3: Describe how a change in energy will affect matter

SOCIAL STUDIES

3SS-E2: Describe the impact of interactions between people and the natural environment on the development of places and regions in Arizona, including how people have adapted to and modified the environment, with emphasis on:

PO 4: how people have depended on the physical environment and its natural resources to satisfy their basic needs, including the consequences of Arizonans' adaptation to, and modification of, the natural environment

3SS-E7: Explain the effects of interactions between human and natural systems, including the changes in the meaning, use, and distribution of natural resources, with emphasis on:

PO 2: consequences to humans of earthquakes, hurricanes, tornadoes, flash floods, and other natural hazards

PO 3: how and why humans modify ecosystems, including deforestation and desertification

New Mexico Standards

SCIENCE

Strand II: Content of Science

Standard I (Physical Science): Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.

5-8 Benchmark I: Know the forms and properties of matter and how matter interacts.

Grade 5 Performance Standards

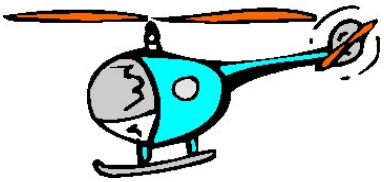
1. Describe properties (e.g., relative volume, ability to flow) of the three states of matter.
2. Describe how matter changes from one phase to another (e.g., condensation, evaporation).
3. Know that matter is made up of particles (atoms) that can combine to form molecules and that these particles are too small to see with the naked eye.
6. Explain the relationship between temperature and

When I first started talking with you, I mentioned that I would also tell you about firefighting tools. Besides all the gear that they carry, firefighters also carry one or more tools with them. These tools are used to fight the fire by digging line. That means that firefighters literally dig lines to halt a fire's advance. Firefighters remove all fuels –things like sticks, leaves and pine needles that can burn – so that the fire can't continue to grow.

The three primary tools firefighters use for this kind of work are right here. Can anyone guess what these are called? The McCloud has a heavy rake on one side and a sharpened scraper on the other. It works well in areas with thick pine needles, duff and dirt but doesn't work so well in rocky areas.

The Pulaski, on the other hand, works very well in rocky areas. It has an axe on one end and a sharpened grub end on the other. You can dig rocks out of your line and dig down to mineral soil with the grub end and cut small trees or branches that hang over your line with the axe.

The shovel allows a firefighter to scrape a line using less upper body strength than the other tools require. That's important because firefighters work very long hours for several days straight and often experience fatigue. The shovel can also be used to scoop up dirt and throw it at flames on trees or bushes nearby. If the flames are small and isolated, this action could help put them out.



There are lots of other resources used to put out a fire – including engines, helicopters, air tankers, and bulldozers – but the three tools I just showed you are the primary ones used by on-the-ground firefighters. Now, I need a few people to help me demonstrate how to dig a fire line. (Show them how firefighters form a line and each help create the line.) How would you like to do that for 12 to 16 hours per day? Now imagine that you have all your gear on, you have your initial attack pack on your back and you are carrying your tool. How many miles of line do you think you could build?

Now, to the most important part of my presentation. I'm going to share with you some of the knowledge that firefighters have to have before they can ever pick up a Pulaski or McCloud. All firefighters must go through what we call Basic Firefighter

the motion of particles in each state of matter.

Strand II: Content of Science

Standard I (Physical Science): Understand the structure and properties of matter, the characteristics of energy, and the interactions between matter and energy.

5-8 Benchmark II: Explain the physical processes involved in the transfer, change, and conservation of energy.

Grade 5 Performance Standards

1. Know that heat is transferred from hotter to cooler materials or regions until both reach the same temperature.
2. Know that heat is often produced as a by-product when one form of energy is converted to another form (e.g., when machines or organisms convert stored energy into motion).
3. Know that there are different forms of energy.
4. Describe how energy can be stored and converted to a different form of energy (e.g., springs, gravity) and know that machines and living things convert stored energy to motion and heat.

Strand II: Content of Science

Standard II (Life Science): Understand the properties, structures, and processes of living things and the interdependence of living things and their environments.

5-8 Benchmark I: Explain the diverse structures and functions of living things and the complex relationships between living things and their environments.

Grade 5 Performance Standards

1. Identify the components of habitats and ecosystems (producers, consumers, decomposers, predators).
2. Understand how food webs depict relationships between different organisms.
3. Know that changes in the environment can have different effects on different organisms (e.g., some organisms move, some survive, some reproduce, some die).
4. Describe how human activity impacts the environment.

SOCIAL STUDIES

Strand: History

Content Standard I : Students are able to identify important people and events in order to analyze significant patterns, relationships, themes, ideas, beliefs, and turning points in New Mexico, United States, and world history in order to understand the complexity of the human experience.

Grade 5 Performance Standards

1. Describe the characteristics of early societies, including the development of tools and

Training. The very first thing they learn there is the Fire Triangle. Three elements must be present and satisfactorily combined before combustion can occur and continue. Can anyone guess what those three elements are? Draw triangle on board. First, there must be fuel to burn. I'm going to talk with you more about fuel in a minute, because the fuel in our forests has changed substantially over time. Second, there must be air to supply oxygen for the flame. Third, there must be heat to start and continue the combustion process. Remove any single one of these elements, and there can be no fire.

In order for combustion to take place, three things must be present – fuel, heat and oxygen. If any one of these is taken away, combustion will cease.

Let's talk a little bit about what every firefighter needs to know about fuel – and I don't mean the kind you put in your car. When we say fuel, we are talking about the things that carry the fire. Can you think of some fuels in the forest? Fuels can be anything from grasses, pine needles and leaves – what we call fine fuels – to limbs, logs and tree trunks – what we call heavy fuels. The quantity of fuels in the forest and how they are arranged make a big difference in how a fire burns.

A big part of the reason we are seeing so many very large, very dangerous, very destructive wildfires these days is that there are simply too many fuels – like trees and brush – in the forest. Firefighters need to understand why that has happened so that they can work to fight fires.

More than 100 years ago, before our European ancestors settled in this area, low-to-medium intensity ground fires moved through our forests every 2-10 years. That means that every few years, a fire would get started – usually by lightning – and be carried by grasses through the forest. The fires actually did good things for our forests, like recycle nutrients back into the soil and prevent the buildup of pine needles and other materials on the forest floor. Most large trees in the forest would survive the fires, but many small trees would be killed. Early settlers in this area described the forest as being like a park, with big, open spaces in between trees.

When people moved into the forests, things began to change. Settlers allowed their animals to eat all of the grasses that once

adaptation to environments.

5-8 Benchmark I-D (Skills): Research historical events and people from a variety of perspectives.

Grade 5 Performance Standards

1. Differentiate between, locate, and use primary and secondary sources (e.g., computer software, interviews, biographies, oral histories, print, visual material, artifacts) to acquire information.
2. Use resources for historical information (e.g., libraries, museums, historical societies, courthouse, world wide web, family records, elders).
3. Gather, organize, and interpret information using a variety of media and technology.
4. Show the relationship between social contexts and events.
5. Use effective communication skills and strategies to share research findings.

Strand: Geography

Content Standard II: Students understand how physical, natural, and cultural processes influence where people live, the ways in which people live, and how societies interact with one another and their environments.

5-8 Benchmark II-B: Explain the physical and human characteristics of places and use this knowledge to define regions, their relationships with other regions, and their patterns of change.

Grade 5 Performance Standards

1. Describe human and natural characteristics of places.
2. Describe similarities and differences among regions of the globe, and their patterns of change.

5-8 Benchmark II-C: Understand how human behavior impacts man-made and natural environments, recognizes past and present results, and predicts potential changes.

Grade 5 Performance Standards

1. Describe how man-made and natural environments have influenced conditions in the past.
2. Identify and define geographic issues and problems from accounts of current events.

CAREER READINESS

Standard 1: Students will identify their career interests and aptitudes to develop an educational plan which supports personal career goals.

5-8 Benchmark: 1. Students will explore areas of interest and possible career choices.

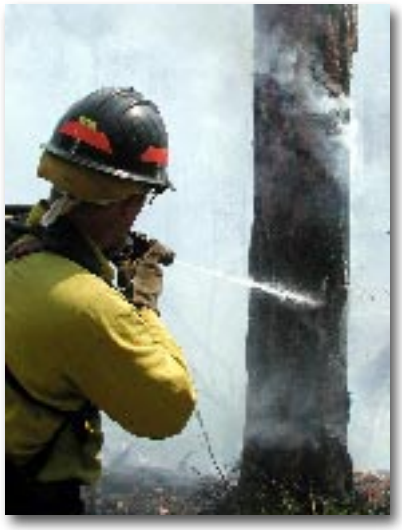
Standard 2: Students will utilize and manage resources effectively to produce quality services and products.

5-8 Benchmark: 2. Students will determine the education and training requirements for careers identified as possible areas of interest.

Standard 3: Students will demonstrate the technological

carried fires. The settlers also quickly put out any fires that did get started because they didn't want the fires to threaten their homes or property. Pretty soon, because there were no fires to clean up the forests or to keep small trees from taking over, a huge crop of young trees started growing. As the years passed, more and more trees started filling up our forests.

You are probably wondering why it makes a difference whether there are more trees or less trees. Let me show you why. I need 5 of you to stand up. Say that those of you standing up lived here together. Each day I brought you 5 sack lunches and 5 bottles of water. You would have plenty of water and plenty of food and would be able to continue growing and developing. Now, 5 more people stand up. Now, you first 5 have to share your sack lunch and bottle of water with these other 5. Because you wouldn't have sufficient water or food, your body would become stressed. You wouldn't grow as quickly, and you would be more susceptible to getting sick. Now everyone stand up. Imagine that you all had to share those 5 lunches and 5 bottles of water. Now, many of you aren't going to be healthy or grow properly because you simply don't have the water or nutrients you need. The same thing happens in our forests when there are too many trees. The trees can't grow as well and many become susceptible to diseases and insect infestation.



This wildland firefighter is using a hose and water to extinguish a snag that is on fire. Water helps to remove heat from the fire triangle, which causes the fire to go out.

The other thing that happens when forests become too crowded is that fires stop moving through the forest on the ground and start being carried from tree to tree. We call these crown fires. Whereas ground fires are good for the forest, crown fires can be very destructive. Instead of helping trees by providing nutrients and removing competition like ground fires do, crown fires can kill acres and

knowledge and skills required for future careers.

5-8 Benchmark: 1. Students will describe ways in which tools, instruments, and equipment are used to solve problems, extend human capabilities and provide for the needs of society.

Forest Service Conservation Education Learner Guidelines

Program title: How To Be a Wildland Firefighter
Target audience: Fifth Grade
Primary topic: How the fire triangle relates to wildland firefighting operations.

Length of program: 1 hour

Setting: indoors or outdoors

Guidelines addressed are referenced here:

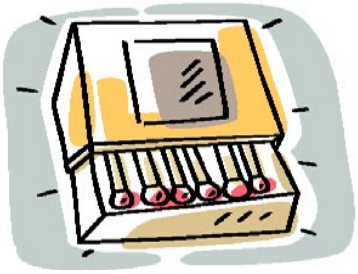
5-8
I. Questioning and Analysis Skills
A2, F2, F3, G2
II. Knowledge of Environmental Processes and Systems
1. A2, B1, C1
2. C3
3. B1, E1
4. A1, C4, D1, D2
III. Skills for Understanding and Addressing Environmental Issues
1. A1, A3, B1, B2, B3
2.
IV. Personal and Civic Responsibility
B2, C1, C2

acres of trees because of how intensely they burn. The more fuels in the forest, the more intensely the fire will burn. The more intensely the fire burns, the fewer trees and other living things that will be able to survive it.

Activity

(Note: This activity was adapted from "Activity 3-4. The Fire Triangle in Wildlands" from "Fireworks Curriculum: Featuring Ponderosa, Lodgepole, and Whitebark Pine Forests," http://www.fs.fed.us/rm/pubs/rmrs_gtr65.pdf)

This activity is going to show us how fires behave in an overcrowded forest. This activity is similar to research done by chemists and physicists. Results from research like this are used by foresters, firefighters, range managers, wildlife biologists and ecologists.



(Show students two matchstick forests – one with only a few matches and one with lots of matches. Explain that the forest with only a few matches resembles the presettlement forest that we just talked about. The forest with many matches is like the forest that exists today. It is overcrowded. Don't do anything with slope. Keep the matchstick forests flat. The goal of this activity is to show that a forest with more fuels – in this case, trees – burns more quickly and more intensely than a forest with fewer fuels.)

(Explain to the students that the individual matches represent trees that have flammable crowns, like the ponderosa pines in our local forest. Before lighting the matches, ask the students for their guess – hypothesis – about how the fires will differ in size and intensity. Why?)

(Light the match tips along one edge of the more open forest and observe the fire behavior. Ask the students their opinion about how the fire burns. Explain what a low-intensity surface fire is like in the forest. Then light the match tips along one edge of the more dense forest and observe the fire behavior. Ask for descriptions of what the students observe and interpretations in terms of the fire triangle.)

(Ask the students to compare the model forests used in this experiment to real forests. What are the similarities? What are the differences?)

Closing

So what does all that mean? It means that our forests aren't healthy right now because there are simply too many trees. People have changed the forests to meet their needs without an understanding of the consequences of those changes. It also means that even though fires are a natural part of our forests, they are becoming larger, more intense and more dangerous because of the unnatural conditions that people have created.

Because of all these things, we must have well-trained, knowledgeable, and dedicated firefighters willing to do sometimes very demanding and very dangerous work. Not only are firefighters working to protect our forests, they are also working to protect our homes and communities, which are increasingly being built in forested areas where fires happen. I hope that today I have been able to give you a little insight into what it is like to be a wildland firefighter – from the gear you need to wear, to the tools you use, to the kind of knowledge and training you must have. Any questions?

Handout

"Student Page 1: Fire Triangle" from the "Living With Fire" chapter of "Ecosystem Matters, Activity and Resource Guide for Environmental Educators"
(If there is time, do the Fire Triangle worksheet together as a class. Otherwise, leave it with the teacher as an assignment for later.)
"Natural Inquirer: Wildland Fire Edition"
(Point out some of the interesting articles related to fire. Encourage the teacher to make use of the activities in the "Natural Inquirer" for future lessons.)

(**Kaibab National Forest only**: Besides these handouts, I'm also going to pass out the Kaibab National Forest Junior Naturalist quiz. To become a Junior Naturalist, you need to have attended a Forest Service program – which you did today! – and then complete this quiz and help to keep the environment clean by picking up litter you find. It is that easy! If you become a Junior Naturalist, we will give you a certificate and a cool patch to wear. Show them the certificate and the patch. When you have completed your quiz, you can turn it into your teacher. Then, he/she can send them into us, and we'll be sure to get a certificate and patch to you. The only chances you get to become a Junior Naturalist are in the second and the fifth grades, so good luck!)

Supplies

- Nomex Pants
- Nomex Shirt
- Boots
- Hardhat
- Goggles
- Ear Plugs
- Leather Gloves
- Fire Shelter
- 45-Pound Pack
- Shovel
- Pulaski
- McCloud
- Matchstick forests (two) (can use clay instead of masonite)
- Trash can lid filled with sand (serves as burning tray)
- Spray bottle with water
- Matches (several boxes)
- Small fire extinguisher
- "Student Page 1: Fire Triangle" (one per student)
- "Natural Inquirer: Wildland Fire Edition" (one per student)
  - www.naturalinquirer.usda.gov

Kaibab National Forest only:

- Kaibab National Forest Junior Naturalist quiz, Grades 4-6 (one per student)
- Junior Naturalist patch (one)
- Junior Naturalist certificate (one)

Student Page 1.

FIRE TRIANGLE

1. Fires need heat, fuel, and oxygen to burn. This is known as th "fire triangle." Draw a triangle below and laabel eaac of the three sides with the word and a picture for each of the three parts.

2. Initially, the heat is provided by an ignition source, which can be human or natural. Name two natural and two human-caused sources of heat for fire ignition.

Natural:

1._____

2._____

Human-caused:

1._____

2._____

3. Fires need fuel to burn. In a forest, what sort of fuels might you expect to find?

Name three potential fuels:

1._____

2._____

3._____

4. Oxygen is available in the air. weather has a rreat influence on when fires occur and on how they spread. Hot temperatures and dry winds can create severe fire conditions by aaffection fuel, moisture, and oxygen. What can dry winds do to fuels to make them more likely to burn?

5. If you cut off any one of these elements a fire will not burn. What are some ways firefighters might cut off each of the three parts of the fire triangle?